Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

SECRET

Hesse-Eastern

Progress Report #10-7-50G-1

EB-160E-1
File Copy

HESSE - EASTERN DIVISION

FLIGHTEX FABRICS, INC.

PROGRESS REPORT #2

ENGINEERING PROGRAM FOR THE DEVELOPMENT OF A LIGHTWEIGHT ANTI-TANK ROCKET

OCTOBER 1957

CONTRACT NO. RD-142

PREPARED BY Paul V. C.
Paul V. C.

APPROVED BY Charles B. W.
Charles B. W.

SUBMITTED BY: HESSE-EASTERN DIVISION
FLIGHTEX FABRICS, INC.
CAMBRIDGE, MASSACHUSETTS

39

SECRET

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

SECRET

Hesse-Eastern

WORK DONE DURING MONTH OF OCTOBER 1957

REPORTING PERIOD 7 OCTOBER TO 1 NOVEMBER 1957

SYSTEM EVALUATION PROGRAM

During October E. M. No. 1 was made stable by the use of folding fins. The next problem for immediate action is ignition. An igniter has been designed and is currently being manufactured.

Ten HEAT heads were statically fired with unsatisfactory results. The average penetration was 8.25" ± .68" in mild steel. Xrays of these heads showed excessive cavitation and possible separation of charge at the interfaces of the three separate pourings. No conclusion can be made regarding the efficacy of the existing design until a test is held with a satisfactory poured charge.

A preliminary launcher mock-up was designed and manufactured. From the evaluation of this mock-up currently in progress, it is expected that a refined prototype version will be designed and manufactured about the end of December, 1957. From the prototype sufficient data should be available to finalize all components and begin manufacture of a final lot.

The triggering elements of the fuze were tested dynamically with satisfactory results. The triggering elements set back properly,

SECRET

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

SECRET

even on very low velocity rounds, and they functioned both on target and on graze. The functioning time was about 1 millisec. Crush-up was about 2.8" with the target placed approximately 20 feet from the launcher muzzle. One fuze employed a rotor. This fuze functioned successfully on target which gives an indication that the rotor armed satisfactorily. Due to the success of the fuze so far experienced, a large quantity of fuzes will be manufactured to carry on testing. Initial testing will be concerned with proving out (1) rotor functioning and (2) safety pin functioning.

SECRET

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Hesse-Eastern

MOTOR DEVELOPMENT PROGRAM

During the month of October emphasis was placed on making E. M. No. 1 stable. Four approaches were made to the problem. First, the c.g. of the round was moved forward by lightening the motor and adapter wall and a portion of the dummy head wall. Secondly, a drag-inducing ring was placed on the ogive of a lightened round. Third, a new ogive was made up having lift and drag characteristics laying somewhere between the original ogive and the ogive with the drag ring and also being 1" longer and heavier to move the c.g. further forward. All three approaches, although showing some improvement, failed to produce a stable round. The fourth approach consisted of using folding fins. From the limited testing with folding fins, this approach appears to be successful. Two rounds which traveled only 50 yards due to partial ignition remained stable and one round properly ignited remained stable over the 120 yards of its trajectory.

Photograph Nos. 8, 9, 10 and 11 in the appendix show the rounds modified according to the four approaches discussed above.

The folding fins are made from .010" phosphour bronze sheet. Each fin is secured to the outside of the motor nozzle section by two drive screws. When fastening the fins, a slight lengthwise bend is introduced to provide stiffness when erected. Four, six or eight fins thus mounted extend tangentially to a maximum diameter of 4.4 inches which is well out in the air stream over the 2.5-inch round diameter.

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Hesse-Eastern

In placing the round in the launcher, the fins are merely bent and overlapped counterclockwise until their O. D. clears the I. D. of the launcher. Once inside the launcher, the fins expand to bear against the I. D. forming an involute type curve. As the round leaves the launcher, the fins spring open to their maximum O. D.

Three rounds were test fired with folding fins, Round Nos. 32, 33 and 34. Round No. 32 had eight fins and was properly ignited. From visual observations, the round flew perfectly stable and hit the top of the dirt mound at approximately 120 yards from the launcher muzzle.

Round No. 33 had six fins, bent to erect radially instead of tangentially. This round was improperly ignited, and the propellant was only partially burnt. Nevertheless, it flew stable before hitting the ground at 50 yards. Round No. 34 exhibited the same characteristics as No. 33. No. 34 had six tangential fins. The stability of these rounds at the short range of 50 yards is significant, since similar short range rounds without folding fins have tumbled violently.

In an effort to overcome ignition difficulties, a plastic (polyethylene) igniter closure has been designed and is currently being manufactured. (See Drawing No. B-8120 in appendix) This igniter will be tested in November, after which an intensive flight test program for target accuracy will be initiated.

Design of E. M. No. 2 has proceeded to the point where material will be ordered sometime in November. The November progress

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Hesse-Eastern

report will include drawings of E. M. No. 2.

Aluminum plates and pins for propellant suspension have been manufactured. They will be tested during November.

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Hesse-Eastern

WARHEAD DEVELOPMENT PROGRAM

Twenty-five HEAT heads (E. M. No. 1) were loaded with Comp B. Ten heads without ogives were statically fired on a stack of 4" X 4" X 1" steel plates, using a cardboard tube to give stand-off. The results are summarized below:

RESULTS OF PENETRATION TEST - 1 NOVEMBER 1957

ROUND NO.	PENETRATION	STAND-OFF
1	7"	5.5"
2	8"	"
3	6"	"
4	8"	6.25"
5	9"	4.5"
6	10"	5.5"
7	7"	5.5"
8	4"	"
9	8"	"
10	9"	"

NOTE: Round Nos. 3 and 8 exhibited exorbitant double jets. All other rounds had double jets to some degree.

Ave. Penetration 8.25" $\pm$ 0.68" (excluding 3 and 8).

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Hesse-Eastern

The set-up for the test is shown in Photograph No. 12 in appendix. The charge was set off by means of an electric blasting cap and tetryl booster. Photograph Nos. 13 and 14 show the holes made in the plate by round Nos. 1 and 2.

The 8.25" ave. penetration was disappointing in view of the 12" expected. Xrays revealed, however, that the reduced penetration and double jets may have been caused by unsatisfactory charges. The charges were formed in three separate pourings. The Xrays showed the possibility of separation between pourings. Also, several voids were apparent. This imperfection presents the possibility that with a properly poured charge the desired penetration may well be attained using the existing head. The Xrays are still being evaluated, and the outcome of the evaluation will determine the future program.

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

LAUNCHER DEVELOPMENT PROGRAM

During October a preliminary launcher was designed and built. The object of this first stage was to obtain hardware as soon as possible in order to evaluate the design by actual physical handling and operating the various components. Thus, using the actual metal parts as the basis for revision, engineering decisions effecting the final design could be greatly facilitated. It should be recognized that many design features had to be frozen before being fully exploited in order to obtain hardware on schedule.

The launcher is shown in photographs in the appendix and a description is given in following paragraphs. This preliminary launcher is currently being evaluated and many fruitful ideas have come forth which indicate that the final launcher will be much more compact, simple and efficient. These ideas are still being exploited and a discussion of them will be presented in next month's progress report.

DESCRIPTION OF LAUNCHER

The launcher as a unit consists of six subassemblies, each of which can be manufactured by different companies and assembled at a central station, if necessary. (See photographs appended)

The six subassemblies mentioned above are:

1. Tube Assembly
2. Front Sight Assembly

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Hesse-Eastern

3. Swivel Handle Assembly

4. Sub-Fuze & Swivel Sight Assembly

5. Lever Spring Assembly

6. Flash Back Tube Assembly

DESCRIPTION OF SUBASSEMBLIES

1. Tube Assembly

This tube is made of wound Phenolic paper and has a wall thickness of .100. The characteristics of this material are such that it can withstand the following tests:

1. Bursting Test

A. Hydraulic oil pressure supplied to the tube.

(1) 400 lbs. required to burst it.

2. Crush Test

A. Tube placed horizontal between two plates. It was compressed .1 to .2 inches before it crushed. Force required was 150 lbs.

3. Shock Test at Room Temperature

A. Tube placed horizontal and supported on both ends.

B. 1 1/2-inch diameter ball dropped on the tube from a height of 9 inches.

4. Water Test

A. Placed in water for 2 hours.

(1) 6 per cent absorption.

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

SECRET

B. Placed in water for 24 hours.

(1) 16.2 per cent absorption.

5. Humidity Test

A. Tube stored in a conditioning box at 165°F and at a humidity of 95 per cent, then removed and placed in storage at -65°F. Upon completion of this cycle, it is placed in a room with room temperature and 100 per cent humidity. The following results were observed:

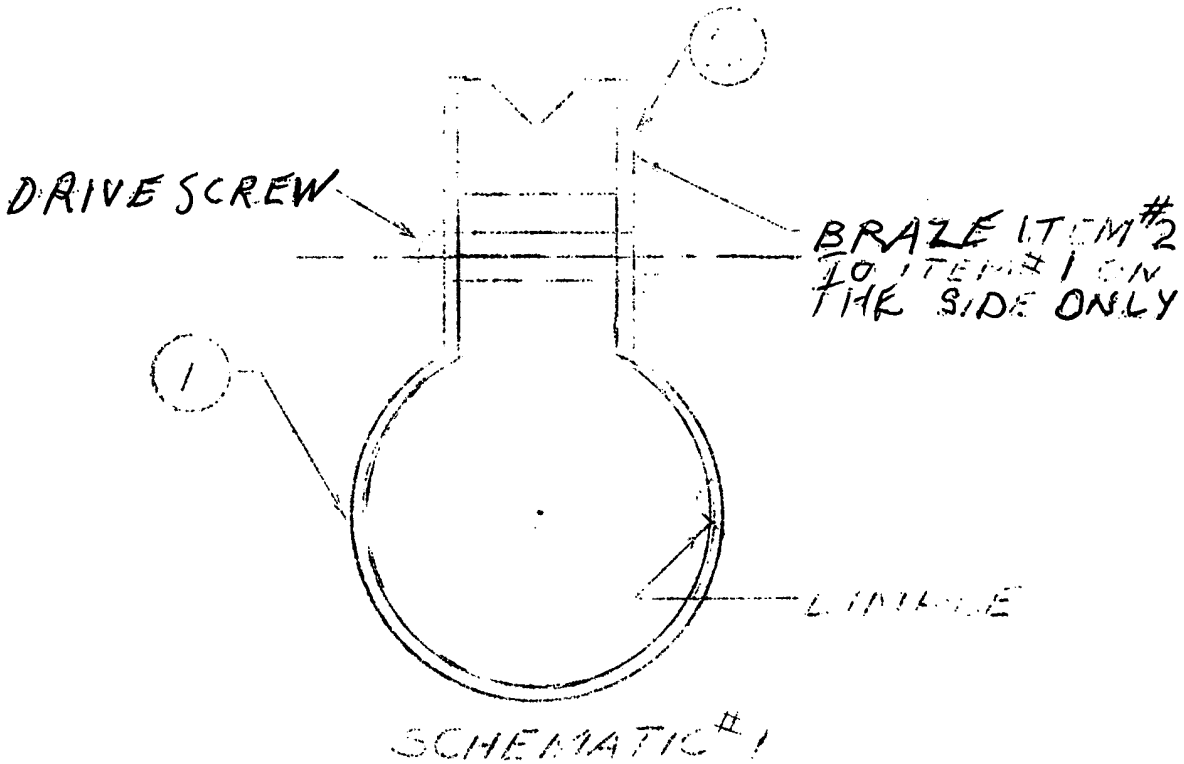
1. Did not warp.

2. Did not change the wall thickness.

3. Did not delaminate.

2. Front Sight Assembly

This assembly consists of a 1/16 thick by 1/2 wide steel strip that is formed to hug the tube. (See Schematic No. 1)



SCHEMATIC #1

SECRET

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

The ends of the strip are then turned upward to receive a small "V" block that constitutes the front sight. This "V" block is brazed on only one side of the clamp as shown on the schematic to allow the clamp to open up when assembling to the tube. Also formed in the clamp is a dimple that fits in a corresponding hole in the tube. This arrangement is used for location and aligning purposes. On assembly to the tube, a drive screw or rivet is used to apply pressure between the "V" block and tube to make the "Front Sight Assembly" a permament part of the tube assembly.

3. Swivel Handle and Clamp Assembly

Parts involved:

1. Clamp-Swivel Handle, Drawing No. A8091
2. Connecting Rod, Drawing No. A8092
3. Spacer, Drawing No. A8093
4. Swivel Handle, Drawing No. A8094
5. Connecting Link, Drawing No. A8095

NOTE: Due to the preliminary nature of this work, drawings will not be included in the report.

1. Clamp

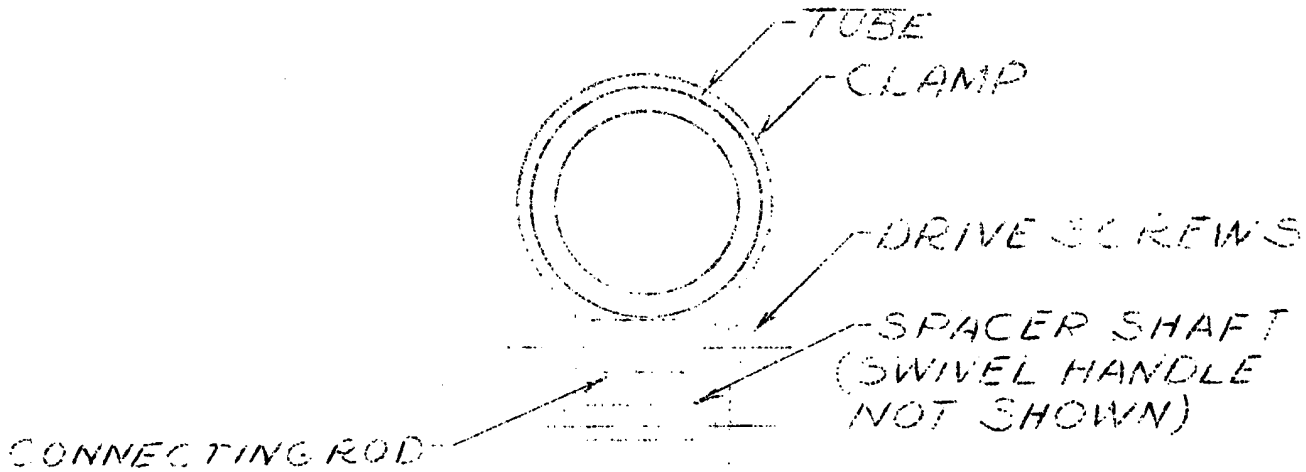
This item is a 1/16 thick by 1-inch wide steel strip formed to hug the O. D. of the tube. Here again, the ends are turned upward to receive the "Swivel Handle" and accessories. A dimple in the clamp is used to locate and align this assembly to the tube.

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

2. Swivel Handle and Connecting Link

To facilitate production, the "Swivel Handle" is a two-piece construction. Therefore, the Connecting Link (A8095) must be assembled to the two-piece handle when it is joined permanently. This subassembly is attached to the clamp by a component that serves two purposes: It acts as a spacer to allow freedom of rotation of the Swivel Handle and as a shaft for the handle to rotate on. This assembly is attached permanently to the tube by mounting the "Connecting Rod" between the "Spacer Shaft" and the tube and fastening drive screws through the clamp and into the Connecting Rod. (See Schematic No. 2)



SCHEMATIC #2

This will apply pressure to the "Spacer Shaft" and to the tube. Care must be taken to develop the right length of the Connecting Rod so that the right amount of pressure will be transmitted to the tube and not

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

cause any deformation of the tube.

The Connecting Link is a 3/32 diameter music wire formed in such a manner as to make a connection of the Swivel Handle to the "Sub-Fuze Assembly". This is done to satisfy both safety and firing conditions. The principles of this arrangement will be explained in detail under the paragraph describing the Sub-Fuze Assembly.

The down position of the Swivel Handle serves the purpose of protecting the trigger on the Sub-Fuze Assembly when the complete unit is in storage and forming an interrupted passageway in the flash back tube.

To fire the launcher, the handle must be moved 90° from the down (storage) position to the firing position. This 90° rotation of the handle will transmit a linear motion of 5/8 of an inch to the "Sub-Fuze Assembly". The reason for this movement will be explained in the paragraph describing the Sub-Fuze and Swivel Sight Assembly.

4. Sub-Fuze and Swivel Sight Assembly

Parts involved:

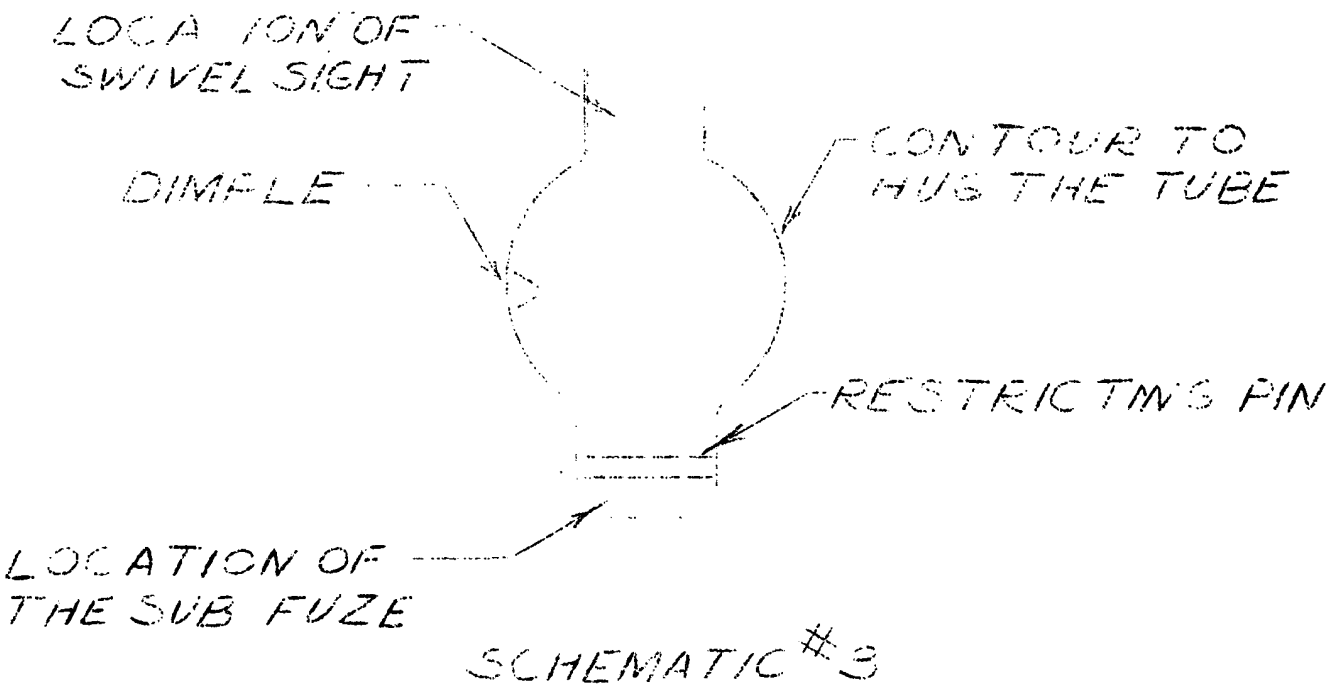
1. Clamp-Sub-Fuze and Swivel Sight Assembly, Drawing No. B8097
2. Swivel Sight, Drawing No. C8098
3. Spring - Storage, Drawing No. C8099
4. Spring - Positioning, Drawing No. C8100
5. Restricting Pin, Drawing No. A8101
6. Spacer, Drawing No. A8102

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

7. Washer, Drawing No. A8103
8. Sub-Fuze Assembly, Drawing No. B8065
9. Housing - Outer, Drawing No. A8066
10. Housing - Inner, Drawing No. A8067
11. Housing - Spring, Drawing No. A8068
12. Firing Pin, Drawing No. A8069
13. Trigger, Drawing No. A8070
14. Cartridge, Drawing No. A8071

The clamp (Sub-Fuze and Swivel Sight) (B8097) in all probability will be of a two-piece construction because of the contour (See Schematic No. 3) required to house the Sub-Fuze and Swivel Sight.



SCHEMATIC #3

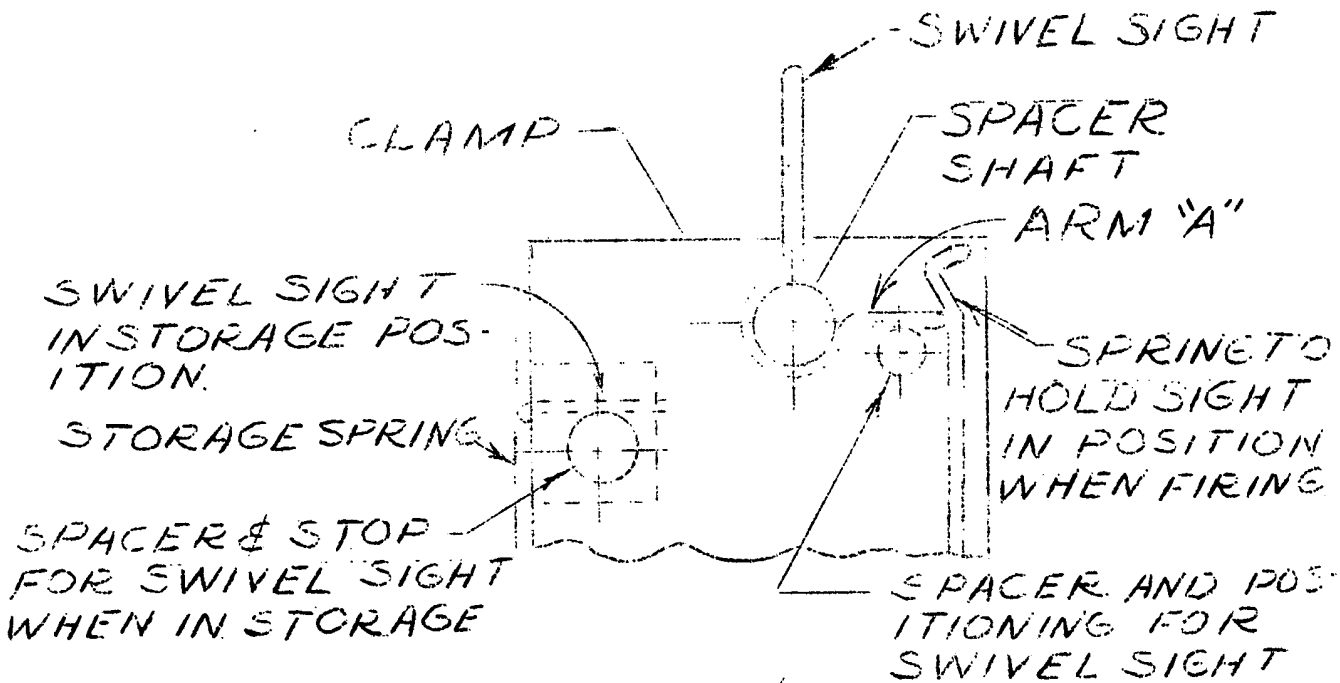
Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Hesse-Eastern

When assembled to the tube, the Swivel Sight, Spring-Storage, Spring-Positioning and its accessories will be a permanent part of the tube. Before mounting of the clamp, a restricting pin will be mounted into the clamp (See Schematic No. 3) to serve as a spacer for the Sub-Fuze Assembly and to hold the clamp from opening when it is being mounted onto the tube. Then the clamp is located on the tube by means of a dimple in the clamp and a recess in the tube.

To explain the final assembly procedure, we shall use Schematic No. 4.



SCHEMATIC # 4

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Hesse-Eastern

1. Place the holes in the two springs in line with their mating holes in the clamp.

2. Position the two (spacer-stop) in line with the holes that locate the spring.

A. Start "Drive Screws" into the (spacer-stop) sufficiently to hold springs and spacers in place.

3. Assemble "Spacer and Shaft" to the swivel along with two washers (not shown in the sketch). Insert between the turned up section of the clamp until the holes in the spacer are in line with its mating hole in the clamp. Insert "Drive Screws" and tighten.

4. Tighten the remaining Drive Screws. The tightening of these Drive Screws should be sufficient to force the clamp against the spacers to orientate the swivel sight and also apply pressure to the tube to make the clamp assembly stationary.

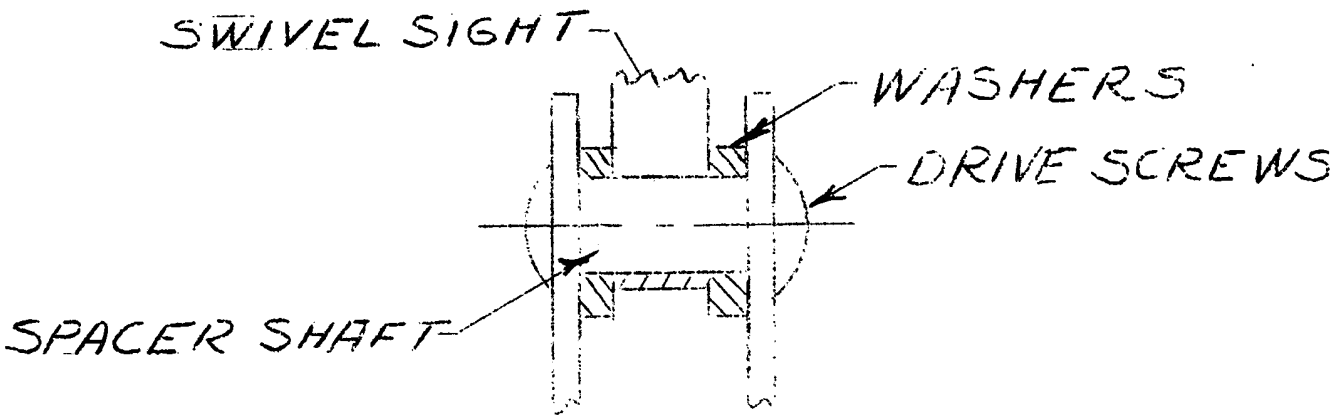
The operation of the swivel sight will be manual. When the swivel sight is in the storage position, arm "A" will be in an upright position. By applying pressure against arm "A" with a forefinger, the long arm of the swivel sight will pop out of the recessed groove in the storage spring to a position where the short arm "A" makes contact with the positioning spring. An extra light force behind the long arm by the forefinger is required to force arm "A" pass the positioning spring until it hits the spacer-stop. The swivel sight will then be locked into position for aiming the launcher at a target. If the occasion calls for a re-storage of the launcher, a continuing

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

pressure behind the swivel sight by the forefinger will cause the sight to force its way past the positioning spring and pop into the recess of the storage spring. A spacer-stop again is used to stop the swivel sight in the right position. When the sight is in this position, it is protected from damage by the sides of the clamp that houses it.

For the present mock-up that is being made, two washers will be used to occupy the space to locate the swivel sight and still allow it to rotate freely. (See Schematic No. 5).



SCHEMATIC #5

For production and to account for the accumulation of tolerances, a spring washer will be used on one side to take up the slack and to apply a light pressure to the swivel sight so that it will not rotate too freely.

Operation of the Sub-Fuze Assembly in relationship to the firing of the launcher is a function of the Swivel Handle. When the Swivel

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Handle is in the down position (storage), the "Sub-Fuze Assembly" will be in a forward position. This forward location will unveil blow holes in the union which houses the flash back tube. Therefore, the flash of a premature firing of the detonator will be expelled to the atmosphere and not to the igniter in the rocket.

The backward motion of the "Sub-Fuze Assembly" when the "Swivel Handle" is lowered serves many purposes. The prime purpose is to slide the movable flash tube to a position where it will cover the blow holes in the union and at the same time pierce a thin plastic membrane located in the stationary tube. This plastic wall will be used to deflect any flash that may possibly by-pass the blow holes in the union on premature firing. A clear passage to the igniter in the rocket is established when the "Swivel Handle" is lowered.

During this same backward motion of the Sub-Fuze Assembly, a third operation is being performed by a cam that is brazed on the movable flash back tube. The cam will make contact with the "Lever Spring" (C8104) that compresses a pin leading to the main fuze in the rocket. This operation is required to make the rocket fuze operable when the launcher has been fired.

At present, this design will be carried along as an alternate together with a new design in the rocket fuze that will eliminate the pin leading to the Lever Spring and cam. This new design in the fuze will simplify many manufacturing and assembly problems.

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Hesse-Eastern

The remaining components that complete the launcher are the stationary flash back tube leading to the igniter in the rocket and the two brackets that mount it to the tube.

FUTURE PROGRAM

The future program consists of (1) firing rounds in the tube, (2) checking blow-back tube, (3) revising various elements for simplicity and efficiency and (4) investigate alternate ignition system (firing pin in rocket igniter).

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Hesse-Eastern

FUZE DEVELOPMENT PROGRAM

Twelve test vehicles (Test Vehicle III in appendix) without rotor were fired during the reporting period. The vehicles were described in last month's report, and a cross-section is shown on photograph 21 appendix. One fuze assembly, complete except for the safety pin, was also dynamically fired. The results of these tests were satisfactory, and with the indicated changes on the drawings, orders could be released for 200 prototype fuzes.

The following is a tabulation of tests during the reporting period:

Date	No.	Temp.	Test Veh.	Rd. Wt. Gram	Velocity (F/S)	Function Yes	Function No	Func. Time (Sec.)	Crush-up (")	Camera Record
10/11	12	+120	Test III	1729	295	X		.001	Grazed target	Yes
	13	A	"	1719	300	X		.001	2.82	Yes
	14	A	"	1717	286	X		.001	2.9	Yes
	15	+120		1716		X				No Pic.
	16	A	"	1714			X	Did not set back, Cocked.		No
10/18	22*	-20	"	1730		X				No Cam. Record
	23*	-20	"	1740		X				

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Hesse-Eastern

Date	No.	Temp.	Test Veh.	Rd. Wt. Gram	Velocity (F/S)	Function Yes	Function No	Func. Time (Sec.)	Crush-up(")	Camera Record
10/18	24*	-20	Test III	1740		X				
	25	+120	Rotor	1728	286	X		.0008	2.84	
	26	+120		1750	269	X		.0005	3.2	
11/1	32		Test III	1700		X				No Cam.
	33			1671		X				"
	34			1605		X				"

NOTE: Test Vehicle III Photograph in Appendix.

* Very low G's.

It must be noted that after round No. 16 certain changes were made in the components, and no further malfunctioning has been experienced to date. Wherever no camera records are available (round Nos. 16, 22, 23, 24) because of delayed ignition, the launching acceleration was far below what must be expected if proper ignition takes place.

Round No. 16 did not set back, and upon examination, it was found that the triggering components had cocked in the housing bore. A careful study of tolerance conditions and of the lock spring resulted in changes in the tolerances and in a reduction of the force which tends to open up the lock springs. The results of these changes seem very encouraging to date.

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

SECRET

In round No. 25 the detonator was housed in a rotor. The round functioned satisfactory on the target. By the indications received in these tests, the average crush-up of the round with the present ogive is 2.8". The functioning time appears to be under one thousandth of a second. (See photographs in appendix)

Round Nos. 32, 33 and 34 were flight test rounds with test vehicle III for the fuze. The rounds were fired at a target at 100 yards. Because of problems in ignition, only round No. 32 reached the target. Nos. 33 and 34 grazed the ground at approximately 50 yards. All three fuze vehicles functioned.

CONCLUSIONS

The testing to date has proven that the correct parameters were chosen for the fuze. More test data will have to be gathered to fully confirm functioning and to find any areas of possible trouble. It appears that there are no difficult problems in the way to a reliable fuze. The next important steps are the introduction of the rotor and safety pin to the fuzes which are being tested.

ROTOR AND ARMING

The fixture for establishing arming delay (see September report)

SECRET

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

was used extensively during the month, and preliminary tests showed an expected arming distance of 10 feet. However, the fixture was modified to take an actual fuze which decreased the mass of the rotor considerably and tests with this new fixture point to an arming distance of between 5 and 6 feet. (See attached memorandum) The size of spring wire chosen for the torque spring was .012". This gave the slowest motion without the use of a spring so fragile as to make assembly difficult. The slot in the rotor shaft has been changed to a hole to give the torque spring better guidance. A study is being conducted toassure that the setback motion of the triggering components will be sufficient under all tolerance conditions to free the rotor for turning.

IMPROVED DESIGN

A new design using a one-piece rotor is in process which will simplify assembly of the final item.

SAFETY PIN

Intensive design work is being done on the safety pin problem. A pin will be introduced which will prevent the triggering components from settingback, thus making the round safe. The pin will have to be withdrawn before launching. This can be accomplished when the trigger handle or rear sight is being erected. Other alternate safety pin set-ups

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

are being considered. One of the basic design limitations of this effort is to avoid interferring with the functioning of the fuze insofar as it has been already established.

A staking fixture which will be used to stake the detonator into place has been designed and manufactured (see photograph in appendix). This fixture has a positive stop built in that any simple arbor press can be used for staking.

PROGRAM

The fuze program remains on schedule. However, the safety pin program is somewhat delayed owing to delays on the launcher program. The immediate problem is to provide fuzes for dynamic testing of HEAT heads without safety pins. However, the safety pin concept will have to be finalized to the point where any changes in it will not affect any of the basic fuze parts. This work is well under way at the present time.

Components for 200 sets of fuze parts will be released for manufacture as soon as the safety pin can be incorporated in the design. The fuzes will be used for the following:

1. Check operation of the safety pin.
2. Arming distance tests.
3. Dynamic train functioning and penetration using HE heads.
4. Increasing statistical proof of proper functioning by use wherever possible in tests of round components.

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

SECRET

Hesse-Eastern

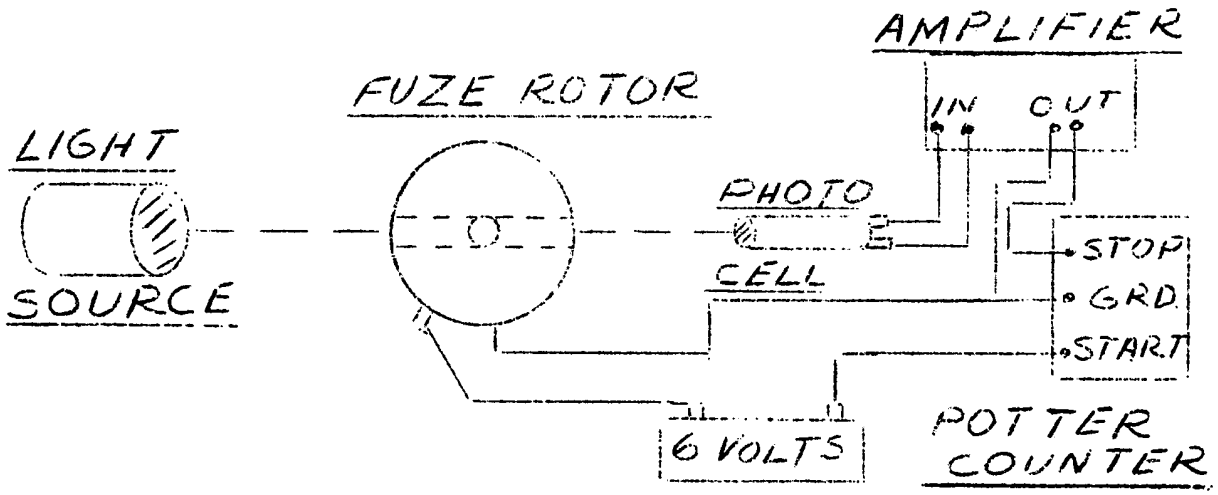
ENGINEERING MEMORANDUM

50G FUZE ROTOR ROTATION TIME TESTS

GENERAL SET-UP

The general procedure was to place the fuze-holding fixture in such a manner that a circuit is interrupted by initiating the rotor rotation thus operating a Potter Frequency-Time Counter start gate. The rotor then passes through approximately 90 degrees of rotation on its axis bringing into alignment a hole which passes a beam of light from a source to a photo-cell which in turn operates the stop gate of the Potter Counter.

General schematic set-up is shown below:



SECRET

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

SECRET

PHASE I

Two general assumptions are used throughout this series of tests, namely,

1. Velocity of the round is 300 feet/sec.
2. Rotor rotation is 90 degrees (approximately).

Three slightly varying types of tests were conducted. First, about 110 rotations were made on each of three springs of varying wire diameter on an old existing spin fixture. Results are as shown in table below:

Wire Dia. Inches	90 Degree Rotations	Average Time (Secs.)	Arming Distance (Feet)
.010	126	.0427	12.8
.012	109	.0336	10.1
.015	114	.0249	7.5

PHASE II

Subsequently a new fuze fixture was manufactured which allowed rapid interchange of fuze springs and/or rotors, and which incorporated a fuze body and bearings similar to those to be used in the final test

SECRET

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

SECRET

product. The end result was to eliminate delaying friction present in the old fixture, thus obtaining more consistent times.

New fuze fixture shown in photograph in appendix.

1. First test on the new fixture was a series of 315 rotations, using an early model spring of .012 inch diameter. Results as shown in table below:

Wire Dia. Inches	90 Degree Rotations	Average Time (Secs.)	Arming Distance (Feet)
.012	315	.0257	7.7

2. Second test runs on the new fixture used later model springs which were the same in all respects as those preceding except that they were wound into a coil of opposite direction, fitting the fuze better and not tending the cock or fall out. Results of these runs are shown below:

Later-Type Springs

Wire Dia. Inches	90 Degree Rotations	Average Time (Secs.)	Arming Distance (Feet)
.012	105	.0195	5.84
.012	105	.0205	6.30

3. The last runs were on a sample of 35 later-type springs to gain more general information relating to uniformity of springs and test

SECRET

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

SECRET

procedure. Results are as shown in table below:

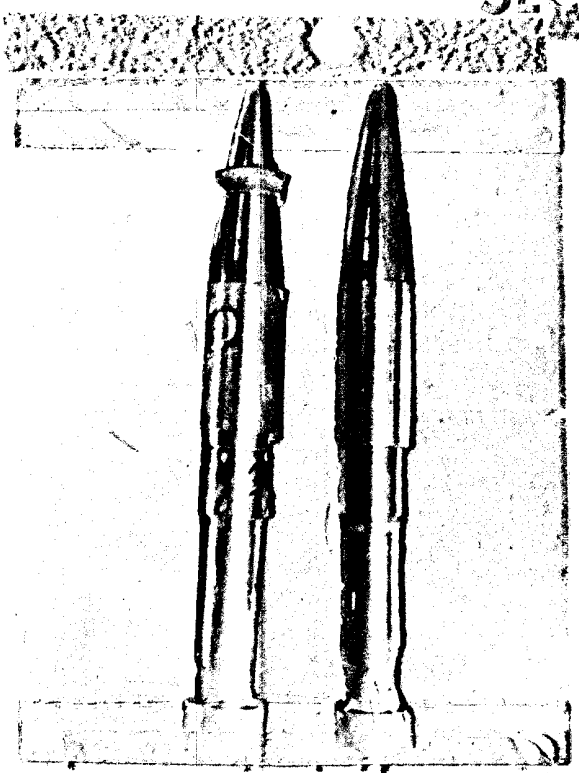
Spring No.	Wire Dia. Inches	90 Degree Rotations	Average Time (Secs.)	Arming Distance (Feet)
1	.012	10	.0196	5.90
2	"	"	.0191	5.73
3	"	"	.0208	6.27
4	"	"	.0196	5.90
5	"	"	.0202	6.08
6	"	"	.0191	5.73
7	"	"	.0193	5.80
8	"	"	.0203	6.10
9	"	"	.0187	5.62
10	"	"	.0210	6.30
11	"	"	.0183	5.50
12	"	"	.0188	5.64
13	"	"	.0206	6.20
14	"	"	.0206	6.20
15	"	"	.0199	5.99
16	"	"	.0187	5.62
17	"	"	.0194	5.81
18	"	"	.0200	6.00
19	"	"	.0194	5.81
20	"	"	.0196	5.90
21	"	"	.0188	5.64
22	"	"	.0196	5.90
23	"	"	.0176	5.29
24	"	"	.0169	5.08
25	"	"	.0166	4.99
26	"	"	.0184	5.52
27	"	"	.0180	5.40
28	"	"	.0167	5.01
29	"	"	.0178	5.34
30	"	"	.0167	5.01
31	"	"	.0186	5.60
32	"	"	.0156	4.68
33	"	"	.0159	4.77
34	"	"	.0144	4.32
35	"	"	.0154	4.62

Over-all Average Arming Distance (Feet) 5.58.

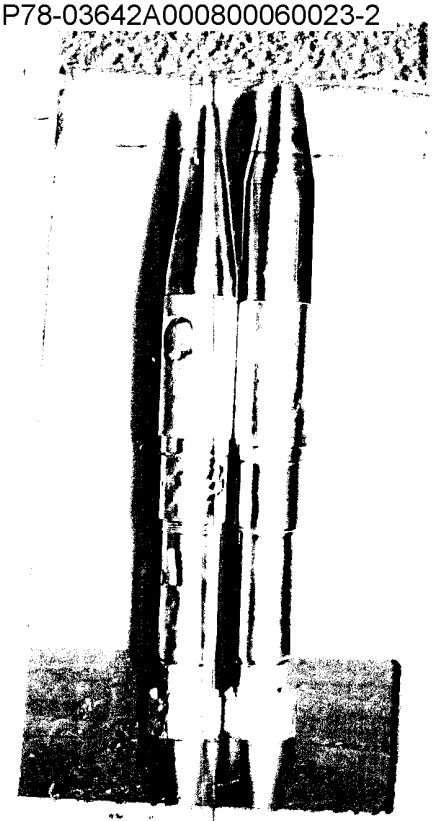
SECRET

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

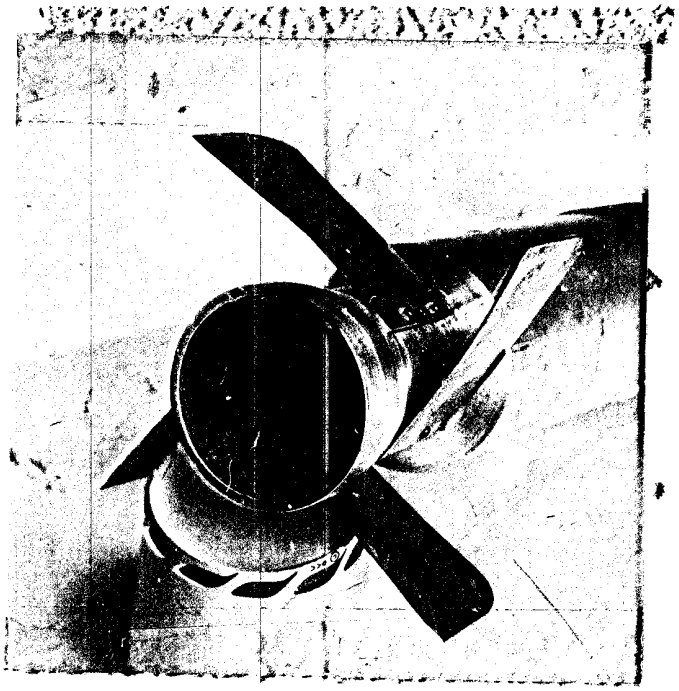
Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2



Photograph No. 2
Front, left to right, G.E. No. 1, G.E. No. 1 with lightened motor, adapter & head, G.E. No. 1 lightened & with drag inducer ring on spike



Photograph No. 3
Left, G.E. No. 1 lightened & Right, G.E. No. 1 with 1/2 longer modified spike to replace 1/2



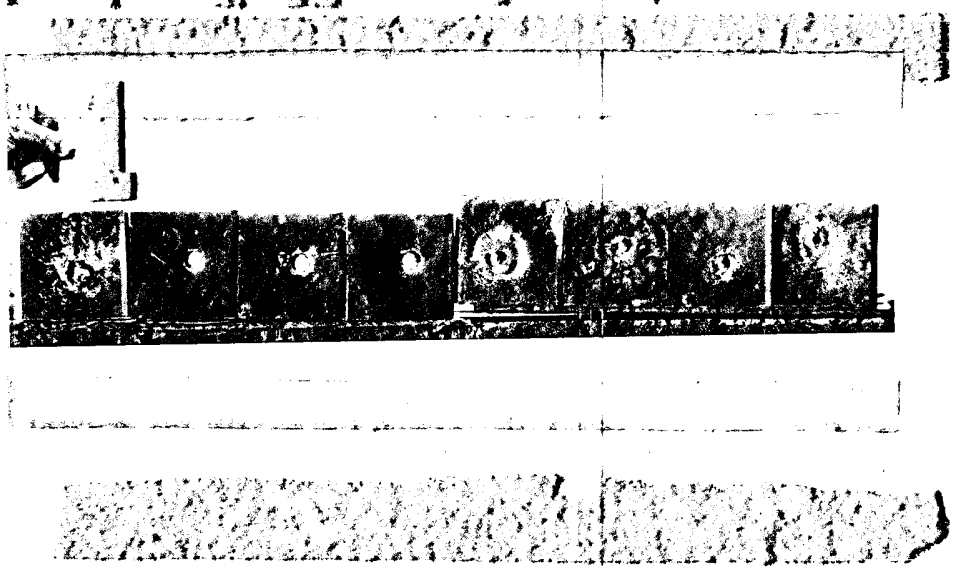
Photograph No. 15
Tangential Folding Fin

Photograph No. 16
Radial Folding Fin

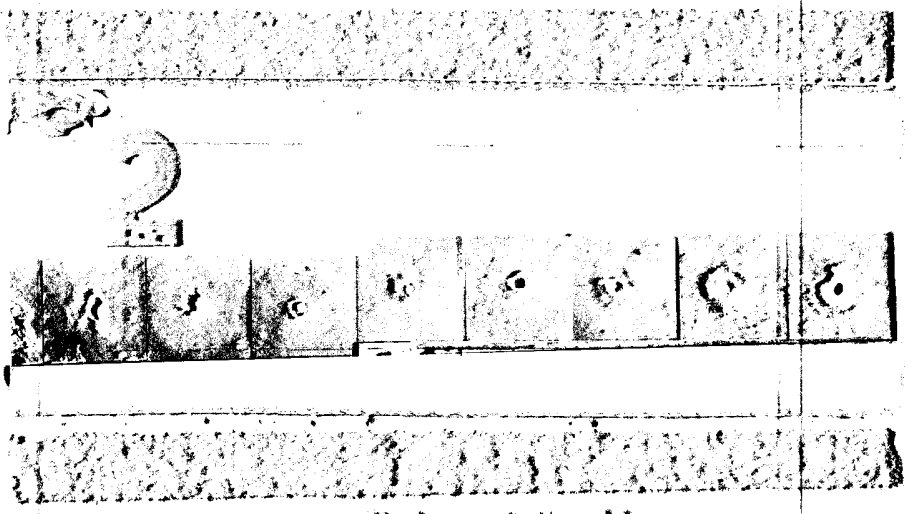
Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Photograph No. 12
Set-up for Static Firing
of HEAT Heads



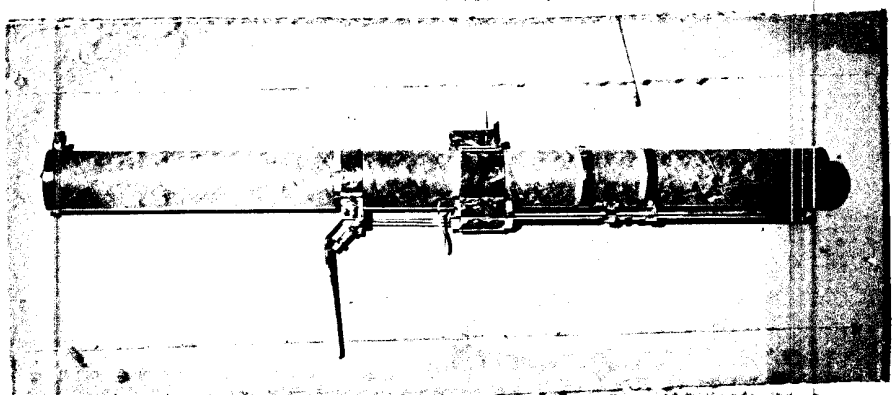
Photograph No. 13
Penetration Results Round No. 1



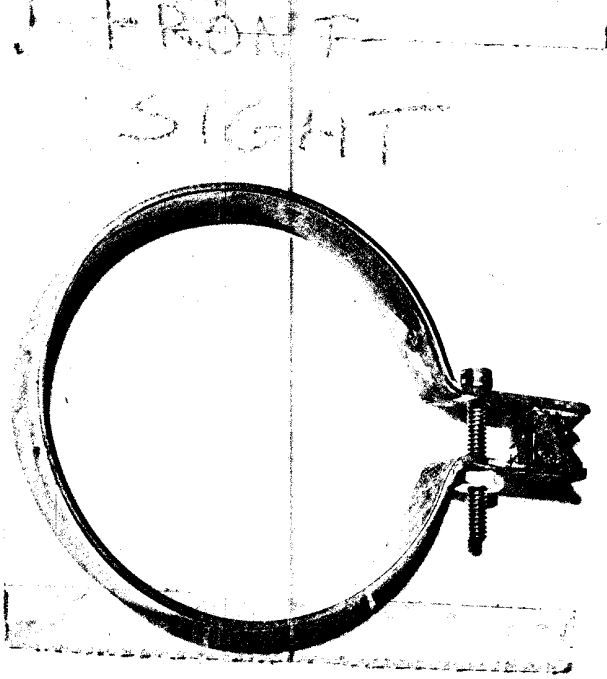
Photograph No. 14
Penetration Results Round No. 2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

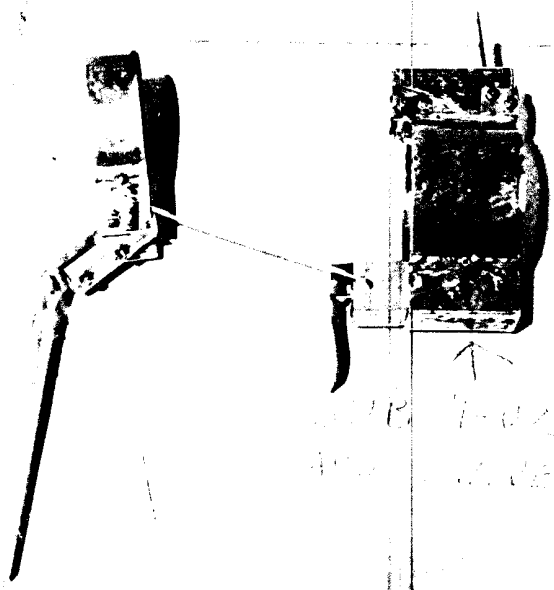
Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2



Launcher Tube Assembly



Photograph No. 1
Front Sight Assembly

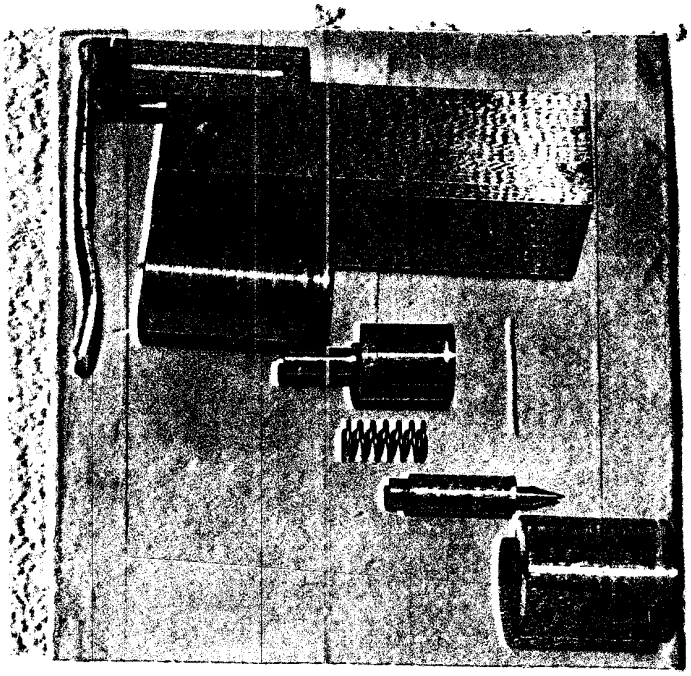


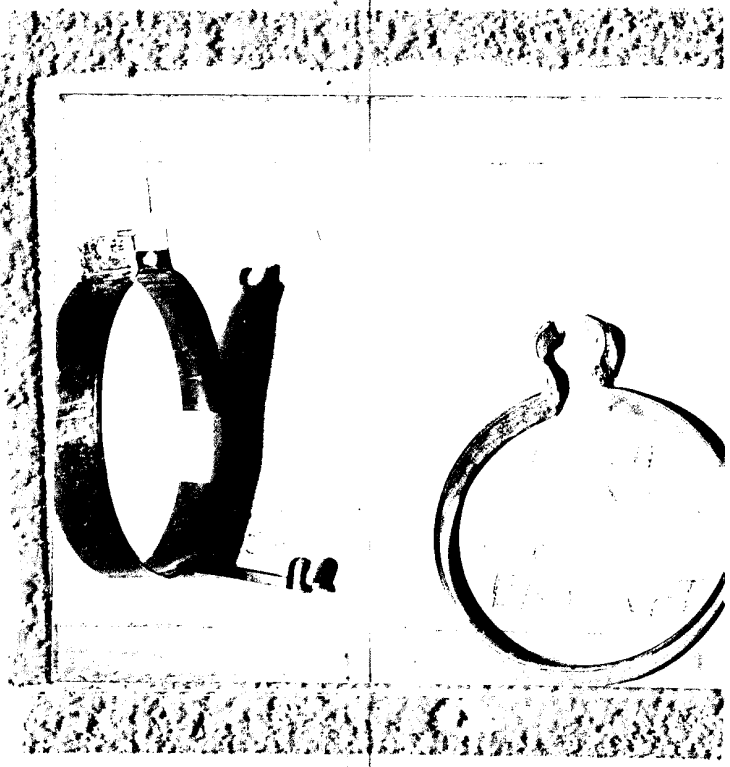
Photograph No. 2
Swivel Handle Assembly
Rear Sight and Sliver Sight Assembly

SECRET

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2





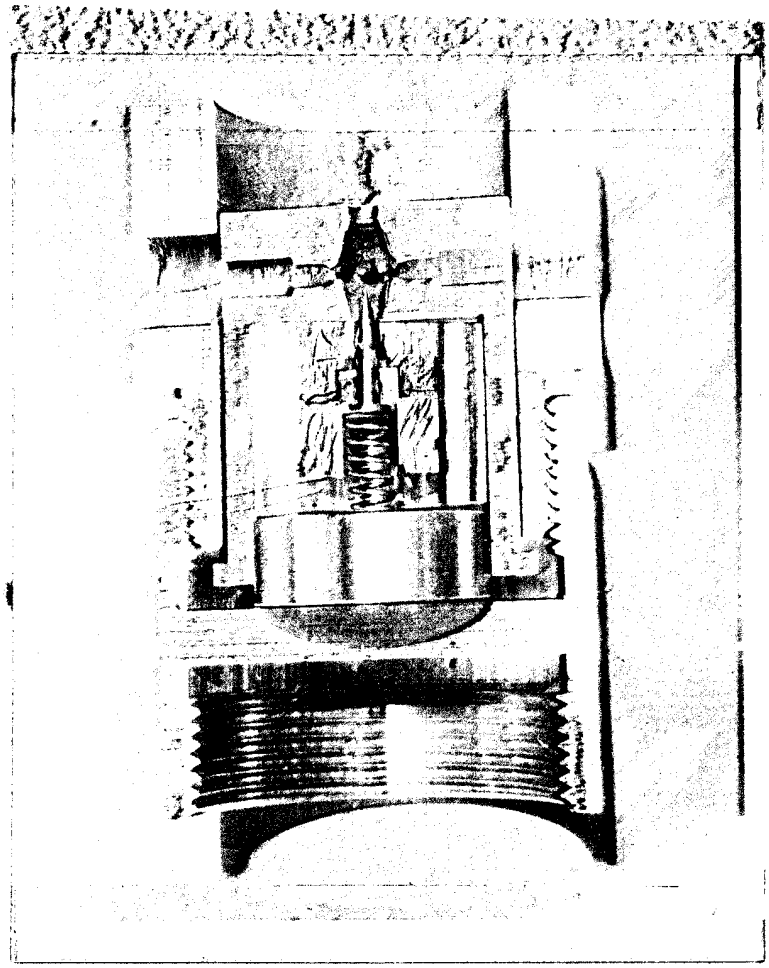
Photograph No. 19
Sub-Fuze Disassembled

Photograph No. 19
Lever Spring and Bracket and Flash Hole Tube Cracker

Photograph No. 20
Head Position Shooting

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

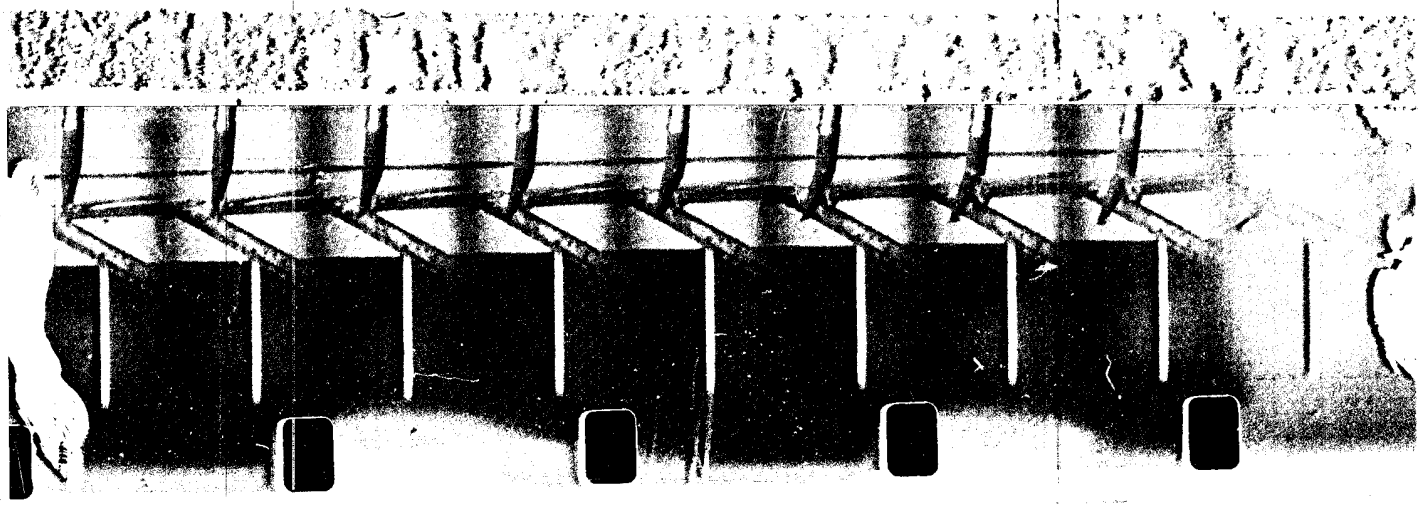
Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2



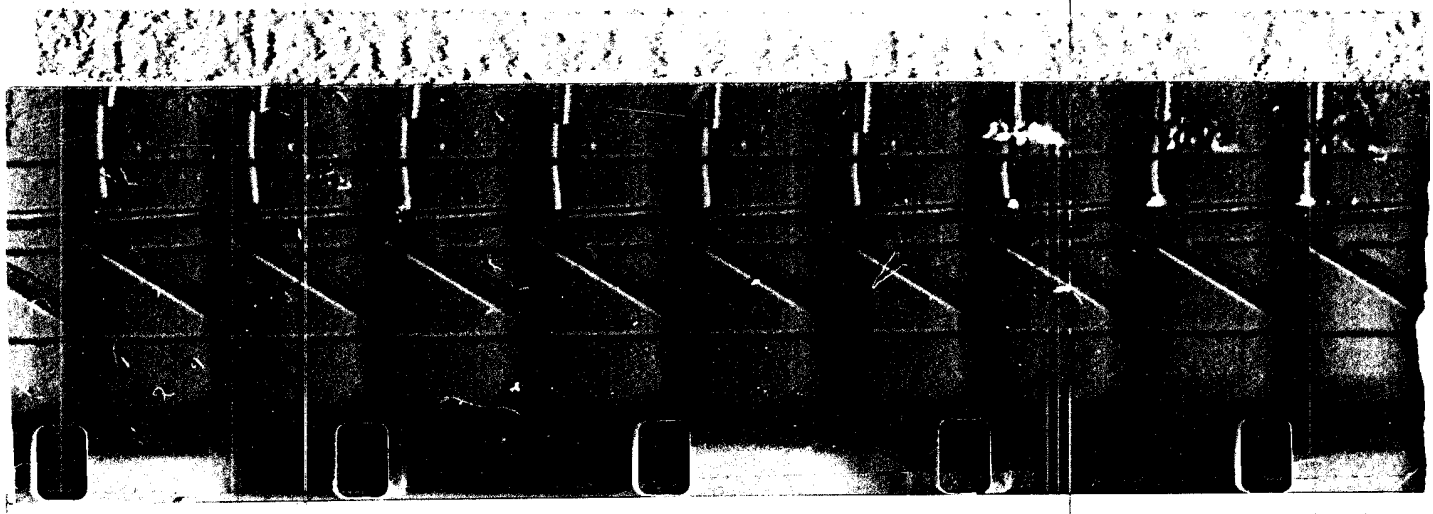
Photograph No. 21
Cutaway View - Fuco Test Vehicle III
After Functioning

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2



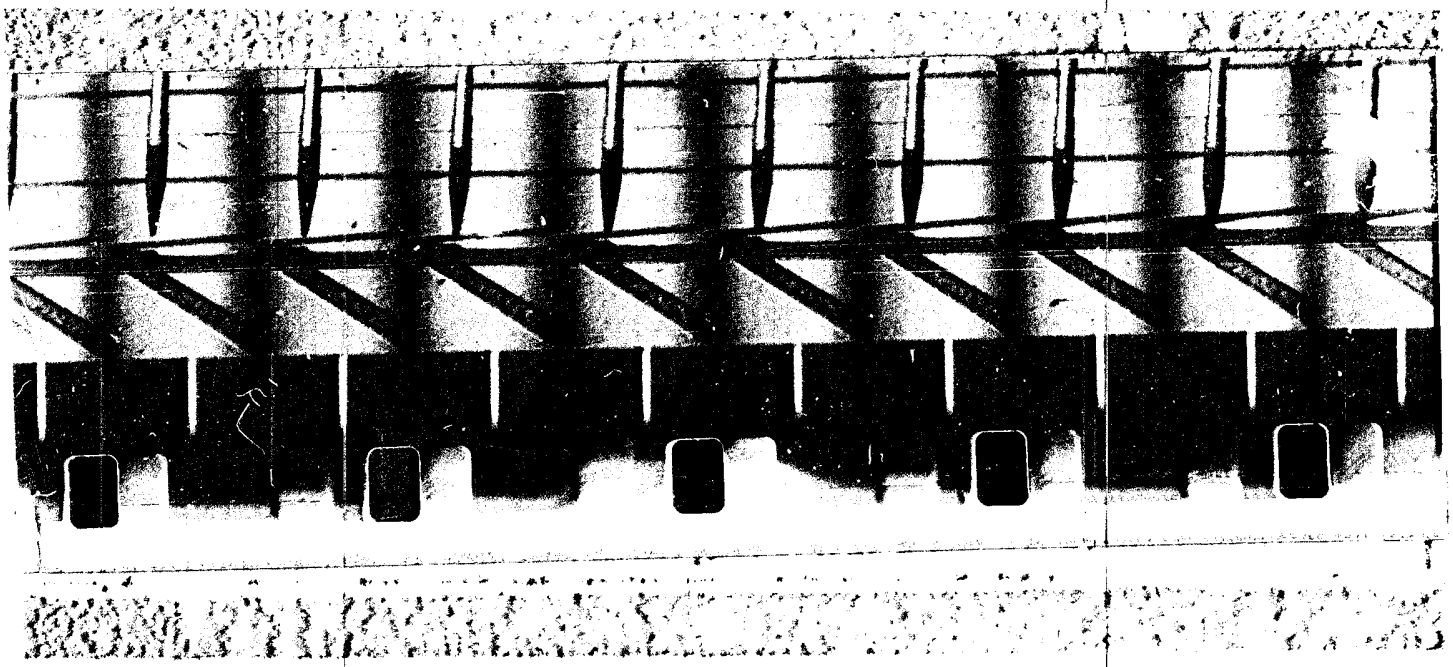
Photograph No. 22
Round No. 12, Fuze Functioning on Target (Crated Target)



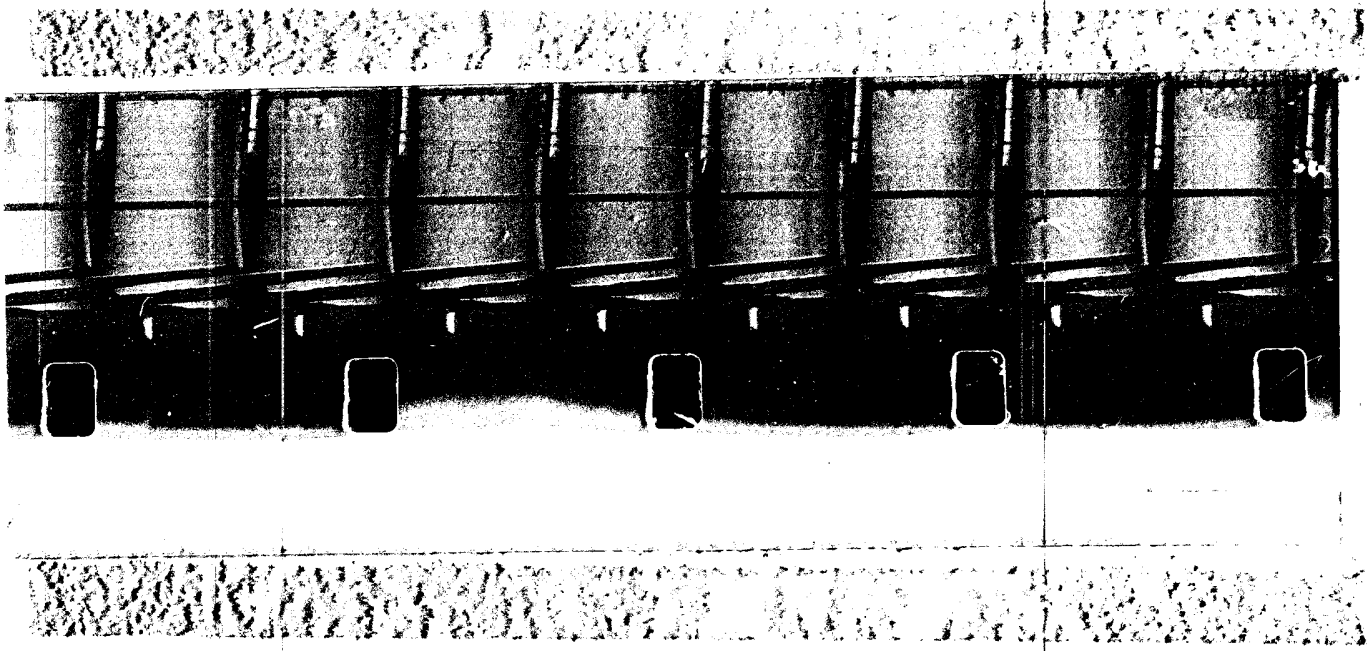
Photograph No. 23
Round No. 13, Fuze Functioning on Target

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2



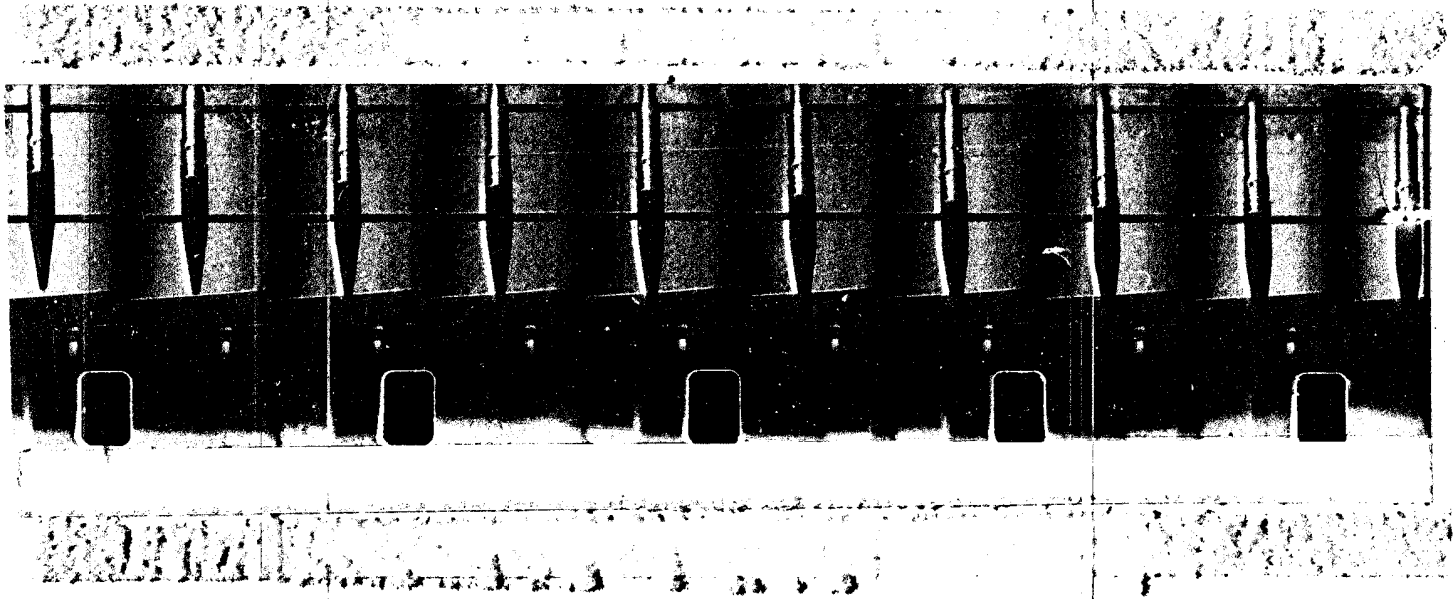
Photograph No. 24
Round No. 14, Fuze Functioning
on Target



Photograph No. 23
Round No. 23, Fuze Functioning
on Target

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

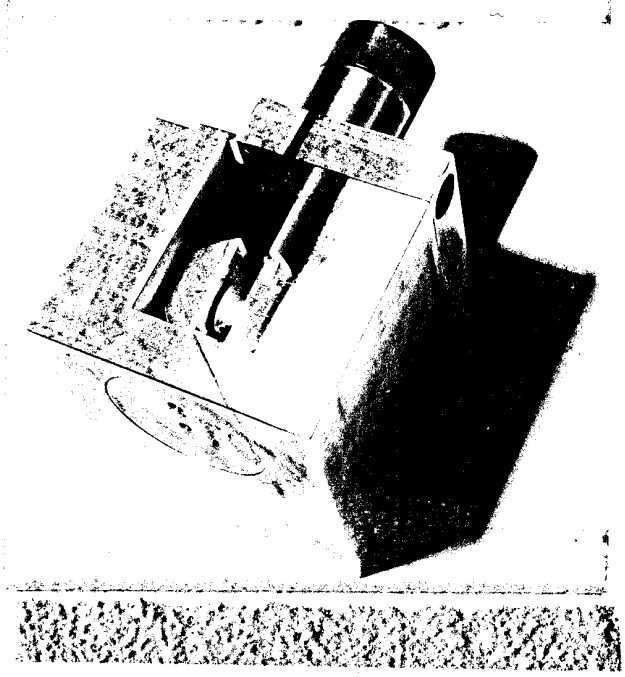
Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2



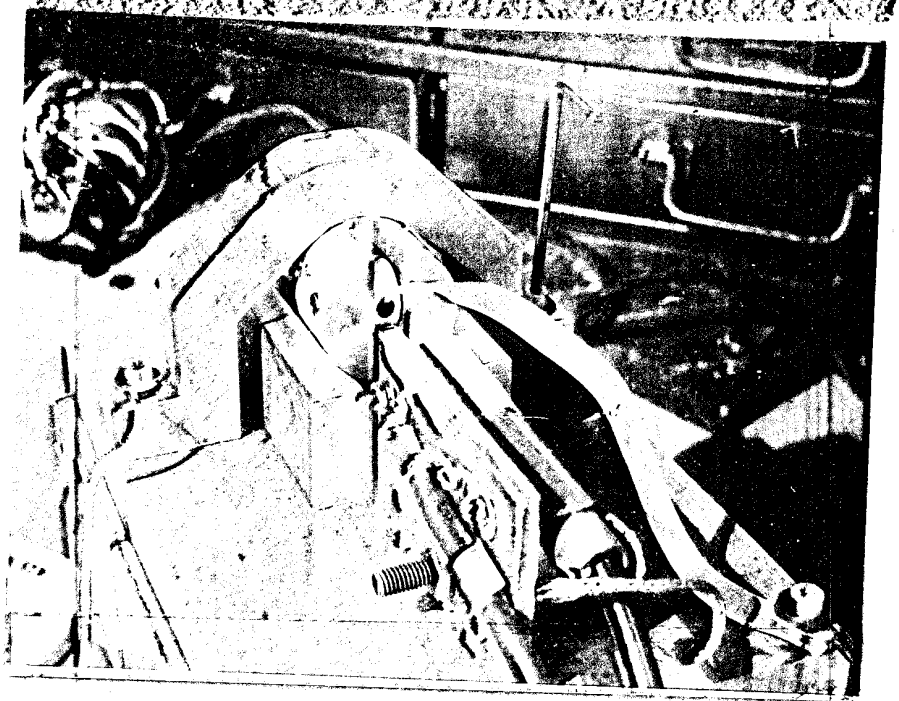
Photograph No. 26
Round No. 25, Fuze Functioning
on Target

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2



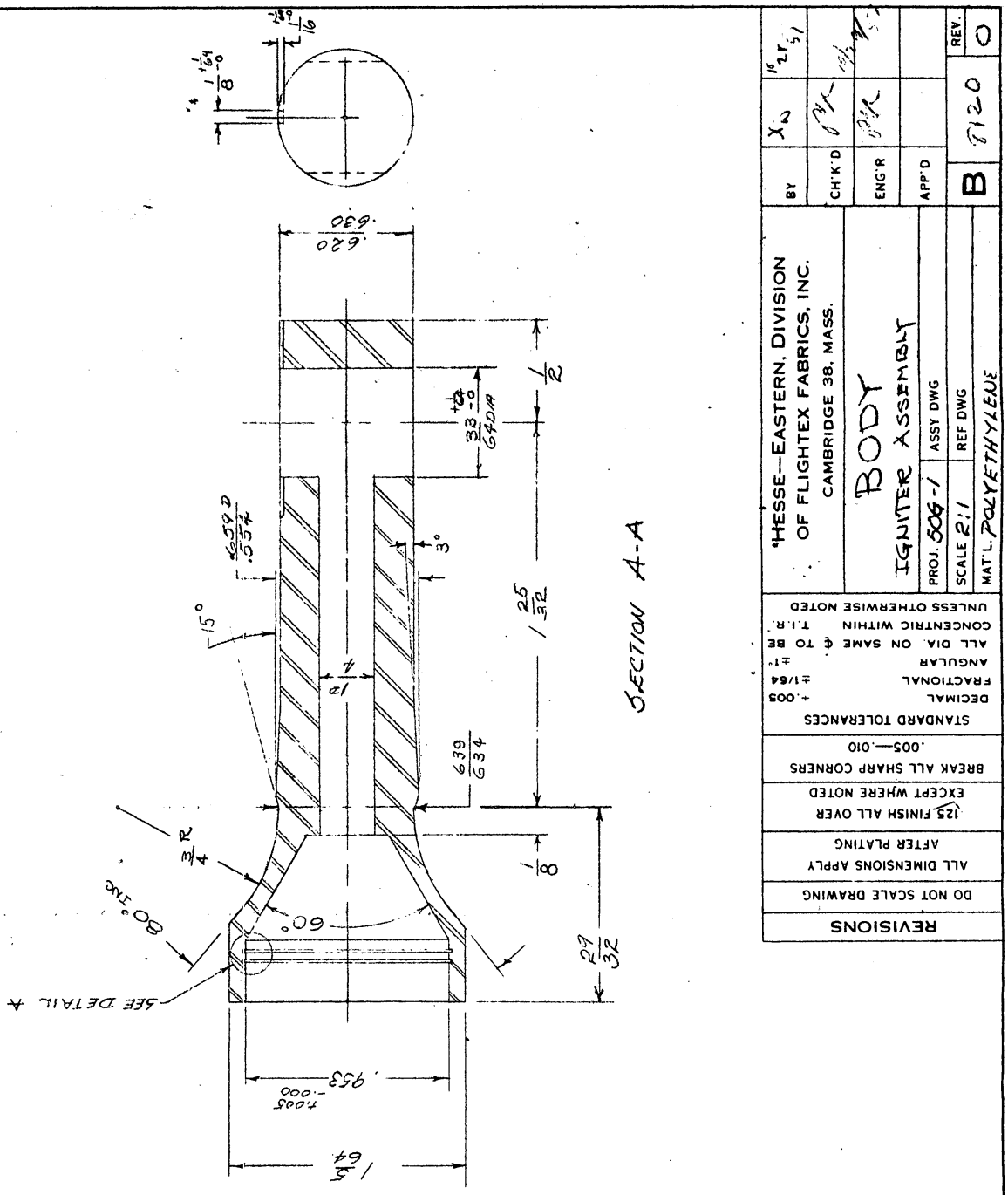
Photograph No. 2)
Underwater Viewing Picture



Photograph No. 3)
Water Viewing Picture

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2



REVISIONS	BY	CH'K'D	ENG'R	APP'D	
DO NOT SCALE DRAWING					
ALL DIMENSIONS APPLY AFTER PLATING					
125 FINISH ALL OVER EXCEPT WHERE NOTED					
BREAK ALL SHARP CORNERS .005—.010					

STANDARD TOLERANCES

DECIMAL	±.003
FRACTIONAL	±1/64
ANGULAR	±1°
ALL DIA. ON SAME ℄ TO BE CONCENTRIC WITHIN	T.I.R.

UNLESS OTHERWISE NOTED

"HESSE—EASTERN, DIVISION OF FLIGHTEX FABRICS, INC. CAMBRIDGE 38, MASS.

BODY IGNITER ASSEMBLY

PROJ. 506-1	ASSY DWG
SCALE 2:1	REF DWG
MAT'L POLYETHYLENE	B 8120 REV. 0

PAT'D 1,2,3

Declassified and Approved For Release 2011/11/08 : CIA-RDP78-03642A000800060023-2